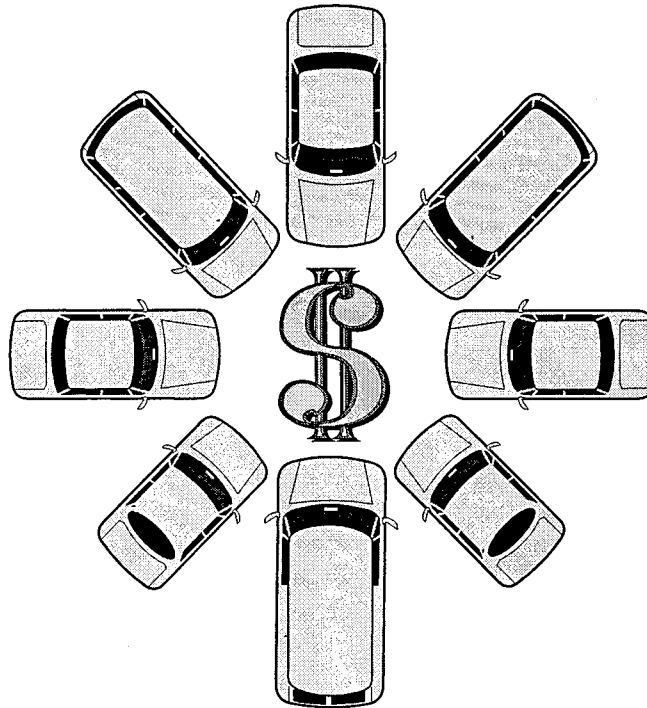


TECHNICAL ASSISTANCE  
REPORT



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# AN INVESTIGATION OF RENTAL RATES FOR CENTRALIZED FLEET VEHICLES



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<p>Abstract</p> <p>This report details a study to investigate the current rental rate structure used by the Division of Fleet Management (Fleet Management) to charge state agencies for the use of centralized fleet vehicles. The researchers conducted a literature review of past studies completed by the Joint Legislative and Audit Review Commission regarding Fleet Management. The researchers then analyzed data from Fleet Management and performed regression analyses to develop new replacement criteria and a new set of rental rates. The impacts of these suggested rates were identified.</p> <p>Recommendations from the report include:</p> <ul style="list-style-type: none"> <li>• Fleet Management should replace passenger sedans and minivans at approximately 105,000 miles and replace full-size vans at approximately 120,000 miles.</li> <li>• Fleet Management should request that JLARC change the current rental rates to the rates suggested in the study.</li> <li>• Fleet Management should reevaluate the rental rates every 2 years and/or after any significant change in vehicle purchase prices or in the composition of the fleet.</li> </ul>				



# **TECHNICAL ASSISTANCE REPORT**

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(The opinions, findings, and conclusions expressed in this report  
are those of the authors and not necessarily those  
of the sponsoring agencies.)

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## ABSTRACT

This report details a study to investigate the current rental rate structure used by the Division of Fleet Management (Fleet Management) to charge state agencies for the use of centralized fleet vehicles. The researchers conducted a literature review of studies completed by the Joint Legislative and Audit Review Commission regarding Fleet Management. The researchers then analyzed data from Fleet Management and performed regression analyses to develop new replacement criteria and a new set of rental rates. The impacts of these suggested rates were identified.

Recommendations include:

- Fleet Management should replace passenger sedans and minivans at approximately 105,000 miles and replace full-size vans at approximately 120,000 miles.
- Fleet Management should request that JLARC change the current rental rates to the rates suggested in this study.
- The rental rates should be reevaluated every 2 years and/or after any significant change in vehicle purchase prices or in the composition of the fleet.





## **TECHNICAL ASSISTANCE REPORT**

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## **INTRODUCTION**

The Division of Fleet Management (Fleet Management) is the administrative unit in the Virginia Department of Transportation (VDOT) that manages the centralized fleet in accordance with Section 33.1-402 of the *Code of Virginia*. The division employs 11 people to administer the fleet and 1 person within each state agency to act as a liaison. The mission of Fleet Management is to provide safe, efficient, and reliable passenger transportation for state employees (Virginia Department of Transportation, Fleet Management, 1994).

The centralized fleet is composed of compact sedans (approximately 71 percent), mid-size sedans (approximately 6 percent), upper mid-size sedans (less than one percent), full-size sedans (approximately 10 percent), minivans (approximately 12 percent), and full-size vans (less than 1 percent). Centralized fleet vehicles are assigned either to the trip pool or directly to 142 state agencies and institutions. Trip pool vehicles are used primarily by state employees in the greater Richmond area for short-term trips (no more than 3 weeks in duration), whereas permanently assigned vehicles are assigned for the long term.

The administrator of Fleet Management asked the Virginia Transportation Research Council (VTRC) to analyze the current rental rates and rate structure to determine what, if any, changes should be made. One reason for the request was that rental rates for centralized fleet vehicles have not changed since 1992, when the rate for passenger sedans was increased from \$0.17 per mile to \$0.19 per mile.

## **PURPOSE AND SCOPE**

The purpose of this study was to assist Fleet Management in improving the rental rates charged for centralized fleet vehicles. An improved rental rate structure would enable Fleet Management to charge customers more accurately for the vehicles rented. The study included all types of vehicle in the centralized fleet and identified the impacts of the developed rate structures on Fleet Management's customers.

## **METHODOLOGY**

To arrive at appropriate rental rates and rate structures, the researchers collected relevant data, determined fleet administrative costs, and determined vehicle cost components. But first, they conducted a literature review to ascertain if other relevant studies had been done.

### **Literature Review**

Virginia's Joint Legislative Audit and Review Commission (JLARC) conducted two studies involving the operations of the Central Garage (now Fleet Management). The first study was completed in 1979, and the follow-up study was published in 1988. The focus of the two studies was somewhat different. The earlier investigation was concerned primarily with the underutilization of state-owned vehicles and the high rates of unreported commuting with these vehicles (JLARC, 1979). Recommendations from the study included specifying criteria for assigning vehicles, developing guidelines for commuting use, streamlining financial management, and creating policies for more general administration. JLARC specified that the minimum mileage that signified the breakeven point for a state car was 12,857 miles (rounded to 12,800 by Virginia's General Assembly).

By the time of the 1988 report (JLARC, 1988), many of the recommendations had been implemented but the problems of underutilization and commuting persisted. In this study, JLARC examined issues such as a vehicle retirement policy with a specified mileage and improved methods to estimate future fleet utilization, costs, and the development of rental rates.

The methodology used in the 1988 study included interviews with VDOT and Fleet Management staff, interviews with fleet managers in other states, and an on-site review of the operation of the North Carolina Department of Transportation's Division of Fleet Management. JLARC staff conducted surveys of state vehicle drivers in Virginia to collect information regarding the assignment of vehicles and commuting practices. Another survey regarding the condition and performance of vehicles was sent to vehicle operators. The final survey involved trip pool use and compliance with vehicle regulations.

JLARC staff conducted observations of maintenance operations, monitored trip pool assignments, and attended an auction of state vehicles. They also reviewed relevant documents and forms regarding operations. Finally, the staff developed independent estimates of vehicle utilization and costs and provided guidelines for the treatment of cash balances. The staff used regression analysis and other methods along with VDOT data to estimate the minimum mileage criteria, vehicle efficiency standards, vehicle replacement criteria, and rates. The researchers in the current study focused on JLARC's methods and findings for vehicle utilization, costs, minimum mileage, vehicle replacement criteria, and rental rates.

JLARC staff determined the number of vehicles that did not meet the minimum mileage criteria in FY 87. Since the mileage requirement was based on the rate structure in 1980, the staff recommended that the mileage requirement be revised to reflect JLARC's proposed rates. The revised criterion was calculated to be 11,649 miles for passenger cars (rounded to 11,650).

JLARC staff examined the optimal timing to replace vehicles. A crucial part of inventory management is finding the optimal time to replace an aging vehicle where enough value has been returned to meet the investment and before repair and operating costs rise substantially. The Central Garage did use the age of the vehicle and the amount of mileage as replacement criteria. They did also consider the condition of the vehicle and whether funds were available to purchase replacements. At the time, the criterion was 80,000 miles or 5 years of age, whichever came first. However, vehicles were being kept longer than this, indicating that the practice did not follow objective, standard criteria and that vehicles could possibly be kept beyond the 80,000-mile or 5-year mark. The task of JLARC staff was to evaluate this existing criteria and suggest alternate criteria. The JLARC methodology was deemed a starting point for further analysis as better data became available.

The total costs considered in determining the efficient life of a vehicle are capital cost (purchase price minus salvage or resale value) and operating costs (fuel, parts, and labor associated with maintenance and repair). Total cost per mile is the sum of these components, expressed in per mile terms. To determine the purchase price for a vehicle class, the actual purchase prices for all model years in the class were averaged. The staff relied on National Automobile Dealers Association (NADA) salvage values for the average resale values of vehicles. The staff had to use the NADA high mileage discount to adjust for the fact that state cars usually fetch lower prices at auctions. The change in vehicle costs is a function of the miles driven. JLARC staff considered using age as an explanatory variable but rejected the idea since they felt operating expenses change only as more miles are driven and not necessarily as the vehicle ages. Analysis showed that the average capital cost per mile tended to decrease as mileage increases. Average operating expenses tended to rise along with mileage.

JLARC staff used regression analysis to estimate the average salvage value and expenses per mile for each class of vehicle in the state fleet. This was done for compact sedans, compact wagons, large sedans, and vans. This analysis makes it relatively simple to calculate the change in salvage value and operating expenses as mileage changes. To estimate the optimal replacement point for each class of vehicle, JLARC staff differentiated the total average cost per mile function mentioned previously. This identifies the minimum point on the total cost function. Beyond this point, costs begin to rise again as mileage rises. The analysis was performed for each vehicle class that had sufficient data and resulted in optimal replacement guidelines for each class. The replacement mileage for compact sedans, compact wagons, large sedans, and vans was 95,000 miles, 118,000 miles, 85,000 miles, and 132,000 miles, respectively. The staff added a caveat that vehicles that prematurely exceed the guidelines for maximum lifetime repair costs should be retired.

The prevailing rental rates were examined during the course of the JLARC study. The rates depended on operating and capital costs and utilization (mileage). JLARC staff first assessed the projections of expenditures and utilization the Central Garage estimated for the biennium 88-90. JLARC discovered that the rates did not recover the costs of fleet operations. Mileage rates tended to be higher and minimum charges tended to be lower than necessary. There were a number of problems with the Central Garage estimates, specifically the method of increasing the fleet size by applying a flat rate to the previous year's *estimate* and not to the actual size of the fleet. JLARC then calculated utilization and costs as an independent estimate.

Their estimate of mileage for the biennium in question was based on the average change in actual mileage between FY 95 and the third quarter of FY 88.

Another difficulty was the Central Garage's cost estimate. They had overestimated both capital and operating costs for several years. Since utilization is overestimated, as mentioned previously, costs would be larger than necessary. The overestimation of costs would have also been fed by the calculation of gas costs. The Central Garage had been using average gas cost and inflating it by a flat rate of 5 percent per year. JLARC staff took the most recent gas price and adjusted it for each year based on accepted estimates of inflation. In addition, there was no accounting for administration costs. JLARC could not estimate this because of data limitations but suggested this cost component be included in the future. Finally, the Central Garage also overestimated the number of vehicles needed.

These revised estimates put forth by JLARC led to the necessity of revising the rental rate structure. The resulting schedule of rates was less complex than those it replaced and allowed the Central Garage to recover costs more accurately. As before, the rate for each vehicle class was composed of an operations and a capital cost component on a per mile driven basis. The operations component was calculated by JLARC staff by dividing the revised estimate for operational costs by the revised utilization estimate for the year. Separate rates were determined for passenger cars and vans.

The capital cost was composed of a per mile charge and a minimum charge. The capital charge depends on the replacement value of the fleet, the vehicle replacement schedule, and this per mile and minimum charge. The required monthly mileage (breakeven yearly mileage divided by 12) was used as the point for assessing the minimum charge. Therefore, the rental rates are the operating cost recovery rate plus the capital cost recovery rate, with the minimum capital charge coming into play when a vehicle is driven less than the required monthly mileage. JLARC recommended that the Central Garage propose a revised method of rate development for JLARC's approval.

The JLARC study faced several data limitations because of errors and missing values in the available data. Some of these difficulties stemmed from the accounting procedures of the Central Garage. The regression equations that resulted from the data analysis led to a relatively simple model based on mileage driven since the addition of extra explanatory variables did not really improve the model significantly and served to make it unnecessarily complex. The data were dispersed, so the regressions tended to have low  $R^2$ , indicating a relatively loose fit of the equation to the data points. A further difficulty in the data was that vehicles with larger than normal repair or maintenance costs, such as those in a crash, tended to be taken out of the fleet early. This practice imparts a bias to the remaining data set, which then represents only the good performers.

### **Data Collection and Analyses**

The researchers collected vehicle operational cost data from VDOT's Division of Information Technology and vehicle auction data and administrative cost data from Fleet

Management. The operational cost data for FY 97 included both year-to-date and life-to-date totals for expenditures (fuel, parts, and labor), mileage, and average miles per gallon for each vehicle in the centralized fleet. The data set included all 3,131 centralized fleet vehicles that were included in the Equipment Management System (EMS) database on June 30, 1998. The 3,131 vehicles included 2,233 compact sedans, 188 mid-size sedans, 10 upper mid-size sedans, 313 full-size sedans, 364 minivans, and 23 full-size vans.

The vehicle auction data set included the 849 vehicles that were sold in auctions from July 1996 through November 1998. The auction data included the vehicle make and type, the original Fleet Management purchase price, the odometer reading, and the auction price for each vehicle.

The researchers analyzed the raw auction and operational cost data to determine if any data points appeared to be outliers that could be removed for cause. No raw auction data points were identified as outliers, and, therefore, the entire data set was used. Of the original 3,131 data points in the raw operational cost data set, 89 data points were identified as being candidates for removal. Of these 89 data points, 23 were identified as being *too* fuel efficient (several had more than 1,000 miles per gallon life to date) and 39 were identified as having *too much* spent on parts (several had life-to-date parts expenditures in excess of \$10,000). Others were identified as having a total operational cost per mile that appeared to be either too low or too high. Examples were a 1994 Plymouth Sundance that traveled more than 90,000 miles without a single penny being spent on parts, labor, or oil, and a 1998 Ford Crown Victoria that got 1.7 miles per gallon of fuel.

The researchers discussed the outlier data points with the fleet administrator. The fleet administrator indicated that purchasing fuel at retail gas stations was a possible explanation for the 23 overly fuel-efficient vehicles and the cost of crash repairs probably accounted for the 39 vehicles with a high expenditure for parts. As for the other outliers, the fleet administrator said that errors in data entry could easily cause these anomalies. Since there were reasonable explanations that could account for the 89 possible outliers, since these 89 vehicles accounted for a small percentage (2.84%) of the data set, and since selectively removing data points could be perceived to be inserting bias, all 3,131 data points were included in the analyses.

### **Determination of Administrative Costs**

The cost incurred by Fleet Management to administer the centralized fleet was obtained by subtracting new vehicle acquisition costs and vehicle fuel, maintenance, and repair costs from Fleet Management's budget.

### **Determination of Vehicle Cost Components**

The researchers performed several regression analyses on the vehicle operational cost data set as a whole and by individual vehicle types. The vehicle types were compact sedan (e.g., Chevrolet Cavalier, Dodge Shadow, Ford Tempo), mid-size sedan (e.g., Ford Taurus, Dodge

Stratus), upper mid-size sedan (e.g., Dodge Intrepid), full-size sedan (e.g., Chevrolet Caprice, Ford Crown Victoria), minivan (e.g., seven-passenger and cargo) and full-size van (e.g., 12- and 15-passenger and cargo).

When selecting the regression models to use, the researchers took into account the statistical significance, the size of the effect, and the relevance of the individual variables in the regression analyses. A variable was not necessarily included in the final models just because it was statistically significant. For example, the variable mileage was statistically significant in the vehicle operational cost per mile regression model. However, the coefficient of mileage was negative. If this were true, vehicles with high odometer readings would on average cost less to operate and maintain than vehicles with lower odometer readings. The JLARC study found the same results. JLARC concluded, as did the researchers, that the data set is biased in favor of good performers. That is, high-mileage vehicles that become expensive to operate are removed from the pool and sold. Or, in other words, Fleet Management does not maintain high-mileage vehicles to the same standard as low-mileage vehicles.

As another example, the variable fuel miles per gallon was also statistically significant in the regression analyses. However, the size of the effect of including fuel miles per gallon in the model was miniscule. The researchers concluded that the contribution resulting from adding the variable fuel miles per gallon to the model was not worth the additional complexity of adding another variable to the model.

The researchers were also attentive to sample size limitations. In particular, the separate regression analyses for each vehicle type were not useful because the sample sizes for mid-size and upper mid-size sedans and large vans were insufficient for meaningful regression analyses. The final regression model for estimating the average auction price of a Fleet Management vehicle was:

$$\text{DFM auction} = -1,667.701 + 0.448 \times \text{DFM purchase} - 158.762 \times \text{age} + 641.571 \times \text{compact}$$

where: DFM auction = estimated vehicle sales price at auction

DFM purchase = cost to Fleet Management to purchase a current model year vehicle

age = age of vehicle at auction (in years)

compact = 1 if vehicle is a compact sedan; otherwise = 0

The adjusted  $R^2$  of the auction price model was 0.581, and the standard error of the estimate was \$547.28.

The final regression model for estimating the average cost per mile to operate and maintain a Fleet Management vehicle was:

$$\begin{aligned} \text{Operation cost per mile} = & 0.05902 + 0.004679 \times \text{age} - 0.0216 \times \text{compact} - 0.01337 \times \text{mid-size} \\ & + 0.09558 \times \text{full-size van} \end{aligned}$$

where: age = age of vehicle on June 30, 1998 (assumed acquisition on December 31 each year)

compact = 1 if vehicle is a compact sedan; otherwise = 0

mid - size = 1 if vehicle is a mid - size sedan; otherwise = 0

full - size van = 1 if vehicle is a full - size van; otherwise = 0

The adjusted  $R^2$  of the operation cost per mile model was 0.185, and the standard error of the estimate was \$0.039063 per mile.

The minimum cost per mile was determined by adding the capital cost per mile and the operational cost per mile equations and taking both the first and second derivatives, as done in the 1988 JLARC study. Vehicle age was used as a substitute variable for mileage because vehicle age was significant in both cost equations, whereas mileage, although significant, was not a logical explanatory variable. Based on Fleet Management data, a centralized fleet vehicle on average traveled approximately 15,560 miles per year from July 1, 1991, to June 30, 1998. Additionally, a centralized fleet vehicle on average traveled approximately 14,810 miles per year from July 1, 1995, to June 30, 1998. In the analyses, the researchers used 15,000 miles per year as the estimate of the average annual distance traveled by a centralized fleet vehicle.

The capital cost per mile (ccpm) equation was:

$$\begin{aligned} \text{ccpm} &= \frac{\text{DFM purchase} - \text{estimated DFM auction}}{\text{mileage traveled}} \\ &= \frac{\text{DFM purchase} - (-1,667.701 + 0.448 \times \text{DFM purchase} - 158.762 \times \text{age} + 641.571 \times \text{compact})}{\text{age} \times 15,000 \frac{\text{miles}}{\text{year}}} \\ &= \frac{0.552 \times \text{DFM purchase} + 1,667.701 + 158.762 \times \text{age} - 641.571 \times \text{compact}}{\text{age} \times 15,000 \frac{\text{miles}}{\text{year}}} \end{aligned}$$

The operational cost per mile (ocpm) equation was:

$$\text{ocpm} = 0.05902 + 0.004679 \times \text{age} - 0.0216 \times \text{compact} - 0.01337 \times \text{mid - size} + 0.09558 \times \text{full - size van}$$

Adding ccpm and ocpm (c&ocpm), keeping only the cost components involving vehicle age and taking the first derivative with respect to age, yielded:

$$\begin{aligned} \text{c\&ocpm} &= \frac{0.552 \times \text{DFM purchase} + 1,667.701 - 641.571 \times \text{compact}}{\text{age} \times 15,000} + 0.004679 \times \text{age} \\ \frac{\partial \text{c\&ocpm}}{\partial \text{age}} &= \frac{0.552 \times \text{DFM purchase} + 1,667.701 - 641.571 \times \text{compact}}{-15,000 \times \text{age}^2} + 0.004679 = 0 \end{aligned}$$

$$\Rightarrow 70.185 \times \text{age}^2 = 0.552 \times \text{DFM purchase} + 1,667.701 - 641.571 \times \text{compact}$$

$$\Rightarrow \text{age}^2 = \frac{0.552 \times \text{DFM purchase} + 1,667.701 - 641.571 \times \text{compact}}{70.185}$$

## RESULTS AND DISCUSSION

### Replacement Guidelines

From the regression analyses, we know that the optimal age at which a vehicle should be replaced depends on the initial purchase price of the vehicle and whether the vehicle is a compact sedan. Table 1 presents Fleet Management contract purchase prices for 1999 model year vehicles and the associated optimal replacement points.

**Table 1. Replacement Guidelines for Centralized Fleet Vehicles**

Vehicle Type	Vehicle	Purchase Price (\$)	Optimal Replacement Point <sup>1</sup>
Compact sedan	Chevrolet Cavalier	11,349 <sup>2</sup>	10.19 (152,850)
Mid-size sedan	Dodge Stratus	14,236	11.65 (174,750)
Upper mid-size sedan	Dodge Intrepid	17,403	12.67 (190,050)
Full-size sedan	Ford Crown Victoria	19,695	13.37 (200,550)
Minivan	GM Safari	19,109	13.19 (197,850)
Full-size van	Ford 15-passenger	21,068	13.76 (206,400)

<sup>1</sup>Optimal replacement point values are presented in years (miles) and assume an average 15,000 miles per year.

<sup>2</sup>The contract price for 1999 model year Chevrolet Cavaliers was \$1,498 less than the price for 1998 model year Chevrolet Cavaliers (\$12,847).

The life-to-date operational cost per mile data indicated a dramatic decrease in the life-to-date operational cost per mile for passenger sedans and minivans after 105,000 miles. Additionally, the life-to-date operational cost per mile decreased for full-size vans after 120,000 miles. The analyses of the data indicated that the operational cost data were biased in favor of good-performing vehicles. The fleet administrator confirmed this belief and stated that Fleet Management does not maintain higher-mileage vehicles to the same standards as other centralized fleet vehicles. Based on this, the results of the regression analyses are valid only up to approximately 105,000 miles for passenger sedans and minivans and only up to approximately 120,000 miles for full-size vans.

### Rental Rates

The regression equations for the capital cost per mile and the operations cost per mile, assuming replacement at 105,000 miles (120,000 miles for full-size vans), result in the costs per mile presented in Table 2.



**Table 2. Vehicle Capital and Operational Cost Components (\$/mi)**

<b>Vehicle Type</b>	<b>Capital Cost</b>	<b>Operation Cost</b>	<b>Capital and Operation Cost</b>
Compact sedan	0.0800	0.0702	0.1502
Mid-size sedan	0.1013	0.0784	0.1797
Upper mid-size sedan	0.1180	0.0918	0.2098
Full-size sedan	0.1300	0.0918	0.2218
Minivan	0.1269	0.0918	0.2187
Full-size van	0.1214	0.1920	0.3134

These costs do not include the administrative costs to operate Fleet Management or the vehicle insurance costs. The total of these costs can be calculated by subtracting vehicle purchase costs and vehicle operation and repair costs from the EMS from Fleet Management's budget. This results in a total administration and vehicle insurance cost of \$912,086.47 for FY 97. The cost for administration and vehicle insurance, based on an average of 43,727,706 miles per year over the past 3 years, is \$0.0209 per mile.

Also, these rental rates do not include additional monies for fleet expansion. In the 1979 JLARC study, JLARC added \$0.01 per mile into the rental rate for fleet expansion. JLARC did not include additional monies for fleet expansion in the 1988 study. From 1992 (when the rental rates were last changed) to June 1998, the size of the centralized fleet increased by 310 vehicles (approximately 52 vehicles on average per year). In addition, during the 6-month period from June 1998 to December 1998, Fleet Management added another 56 vehicles to the centralized fleet. Assuming that an average of 52 vehicles per year will be added to the fleet, and assuming that additions to the centralized fleet will be distributed similarly to those currently in the centralized fleet, the new additions on average would include 38 compact sedans, 4 mid-size sedans, 5 full-size sedans, and 5 minivans.

Using this composition and vehicle purchase prices for the current model year, Fleet Management would need to collect an additional \$682,226 per year for fleet expansion. Based on the average of 44,622,000 miles per year traveled in centralized fleet vehicles from 1992 to 1998, Fleet Management would need to charge an additional \$0.0153 per mile for fleet expansion. Table 3 presents the adjusted rental rates.

**Table 3. Rental Rates Including Fleet Expansion (\$/mi)**

<b>Vehicle Type</b>	<b>Capital And Operation</b>	<b>Administration and Insurance</b>	<b>Fleet Expansion</b>	<b>Rental Rate</b>
Compact sedan	0.1502	0.0209	0.0153	0.1864
Mid-size sedan	0.1797	0.0209	0.0153	0.2159
Upper mid-size sedan	0.2098	0.0209	0.0153	0.2460
Full-size sedan	0.2218	0.0209	0.0153	0.2580
Minivan	0.2187	0.0209	0.0153	0.2549
Full-size van	0.3134	0.0209	0.0153	0.3496

The researchers presented estimates of the rental rates to the fleet administrator, who recommended that vehicle types be grouped, where possible, to simplify the rate structure. The researchers looked at the rental rates, the capital cost and operation cost components, and the current purchase prices for each type of vehicle. The researchers proposed that there be four

separate rental rates for compact sedans; mid-size sedans; upper mid-size sedans, full-size sedans, and minivans; and full-size vans. The capital cost component for upper mid-size sedans, full-size sedans, and minivans was calculated using a weighted average based on the fleet composition in the EMS database. The proposed four rental rate cost components are presented in Table 4.

**Table 4. Rental Rate Cost Components (\$/mi)**

Vehicle Type	Capital Cost	Operation Cost	Fixed Costs <sup>1</sup>	Total Cost	Proposed Rate
Compact sedan	0.0800	0.0702	0.0362	0.1864	0.19
Mid-size sedan	0.1013	0.0784	0.0362	0.2159	0.22
Upper mid-size sedan	0.1282	0.0918	0.0362	0.2562	0.26
Full-size sedan					
Minivan					
Full-size van	0.1214	0.1920	0.0362	0.3496	0.35

<sup>1</sup>Fixed costs are composed of administration, vehicle insurance, and fleet expansion costs.

### **Rental Rate Structures**

Fleet Management currently charges a fixed rate per mile if less than a specified minimum number of miles is traveled per day (or per month). Fleet Management uses the average vehicle utilization as the specified minimum mileage. The stated average utilization is 1,315 miles per month for sedans and minivans and 1,268 miles per month for full-size vans. Fleet Management currently charges \$127.00 per month for sedans and minivans and \$142.60 per month for full-size vans for capital if less than the average monthly mileage is traveled. These minimum capital charges result in capital costs of \$0.0966 per mile for sedans and minivans and \$0.1125 per mile for full-size vans.

As a result of the current minimum capital charges, Fleet Management sometimes collects more revenue for vehicles that travel less than the stated minimum mileage than for vehicles that travel more than the minimum mileage. For example, Fleet Management currently collects \$271 for a sedan or minivan that travels 1,200 miles in a month. However, Fleet Management currently collects only \$266 for a sedan or minivan that travels 1,400 miles in a month. The second vehicle travels an additional 200 miles, but \$5 less per month is collected.

The researchers developed two rental rate structures: an update of the current rate structure that corrects the minimum monthly charge amounts for capital (Method 1) and an alternative rate structure (Method 2).

#### **Method 1: Minimum Charge for Vehicle Capital Cost Based on Average Utilization**

In all of the analyses, the researchers assumed that a vehicle, on average, travels 15,000 miles per year. Based on 248 rental days per year (52 five-day weeks less 12 holidays per year), the average vehicle utilization is 60.48 miles per day (approximately 60 miles per day), or 1,250 miles per month. A minimum daily cost is incurred if average utilization is less than 60 miles per day (trip pool vehicles) or 1,250 miles per month (permanently assigned vehicles). The

minimum cost is equal to the capital cost per mile component multiplied by 60 (trip pool vehicles) or 1,250 miles (permanently assigned vehicles). Tables 5 and 6 present the rental rates for trip pool and permanently assigned vehicles, respectively.

**Table 5. Method 1: Rental Rates for Trip Pool Vehicles**

<b>Vehicle Type</b>	<b>Rental Rate for Average Use &lt; 60 Miles Per Day</b>	<b>Rental Rate for Average Use ≥ 60 Miles Per Day</b>
Compact sedan	\$4.80 + \$0.11 per mile	\$0.19 per mile
Mid-size sedan	\$6.00 + \$0.12 per mile	\$0.22 per mile
Upper mid-size sedan Full-size sedan Minivan	\$7.80 + \$0.13 per mile	\$0.26 per mile
Full-size van	\$7.20 + \$0.23 per mile	\$0.35 per mile

**Table 6. Method 1: Rental Rates for Permanently Assigned Vehicles**

<b>Vehicle Type</b>	<b>Rental Rate for Average Use &lt; 1,250 Miles per Month</b>	<b>Rental Rate for Average Use ≥ 1,250 Miles per Month</b>
Compact sedan	\$100.00 + \$0.11 per mile	\$0.19 per mile
Mid-size sedan	\$125.00 + \$0.12 per mile	\$0.22 per mile
Upper mid-size sedan Full-size sedan Minivan	\$162.50 + \$0.13 per mile	\$0.26 per mile
Full-size van	\$150.00 + \$0.23 per mile	\$0.35 per mile

## **Method 2: Minimum Charge for All Fixed Costs Based on Average Utilization**

This method is basically the same as Method 1 except that the minimum cost includes all fixed costs: cost to administer the fleet, vehicle insurance costs (which are fixed based on the number of vehicles in the fleet), and cost of fleet expansion. Tables 7 and 8 present the rental rates for trip pool and permanently assigned vehicles, respectively.

**Table 7. Method 2: Rental Rates for Trip Pool Vehicles**

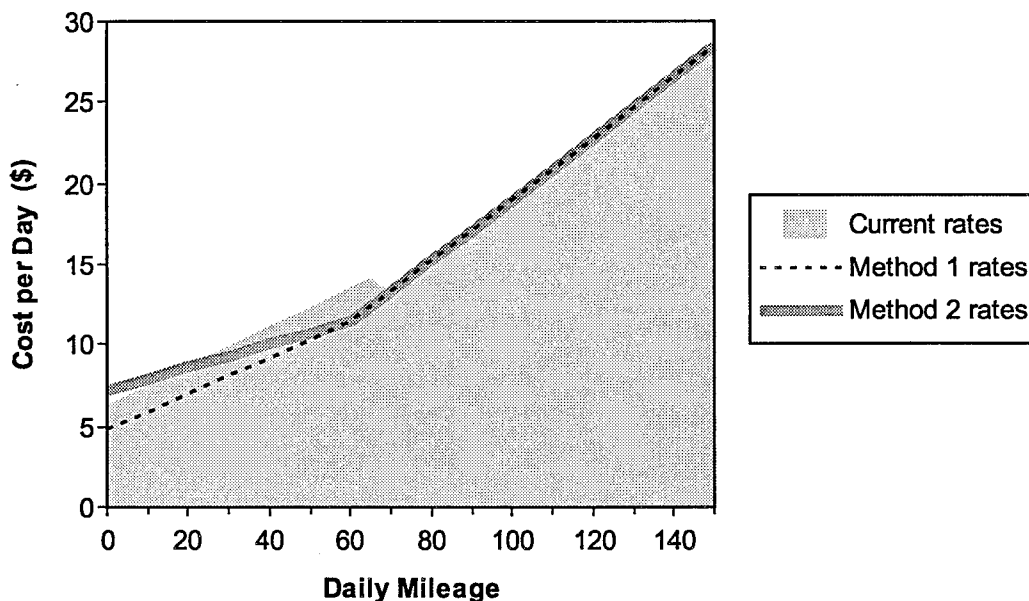
<b>Vehicle Type</b>	<b>Rental Rate for Average Utilization &lt; 60 Miles per Day</b>	<b>Rental Rate for Average Utilization ≥ 60 Miles per Day</b>
Compact sedan	\$7.20 + \$0.07 per mile	\$0.19 per mile
Mid-size sedan	\$8.40 + \$0.08 per mile	\$0.22 per mile
Upper mid-size sedan Full-size sedan Minivan	\$10.20 + \$0.09 per mile	\$0.26 per mile
Full-size van	\$9.60 + \$0.19 per mile	\$0.35 per mile

**Table 8. Method 2: Rental Rates for Permanently Assigned Vehicles**

Vehicle Type	Rental Rate for Average Utilization < 1,250 Miles per Month	Rental Rate for Average Utilization ≥ 1,250 Miles per Month
Compact sedan	\$150.00 + \$0.07 per mile	\$0.19 per mile
Mid-size sedan	\$175.00 + \$0.08 per mile	\$0.22 per mile
Upper mid-size sedan	\$212.50 + \$0.09 per mile	\$0.26 per mile
Full-size sedan		
Minivan		
Full-size van	\$200.00 + \$0.19 per mile	\$0.35 per mile

### Impact of Rental Rate Structures

Figures 1 through 4 present the daily rental rates that would be charged for trip pool vehicles under the existing rate structure and the proposed alternative rental rate structures for each type of vehicle. Figures 5 through 8 present the monthly rental rates that would be charged for permanently assigned vehicles. The figures are presented to demonstrate the impact of changing the rental rates for centralized fleet vehicles from the existing rate structure to the two new structures developed in this study. Figures 1 and 5 are the most significant since approximately 70 percent of the vehicles in the centralized fleet are compact sedans. Since the average annual vehicle utilization is approximately 1,250 miles per month, Figure 5 indicates that if the Method 1 rental rate structure were adopted, Fleet Management would lose a significant amount of revenue.



**Figure 1. Daily Rental Rate Comparison for Compact Sedans**

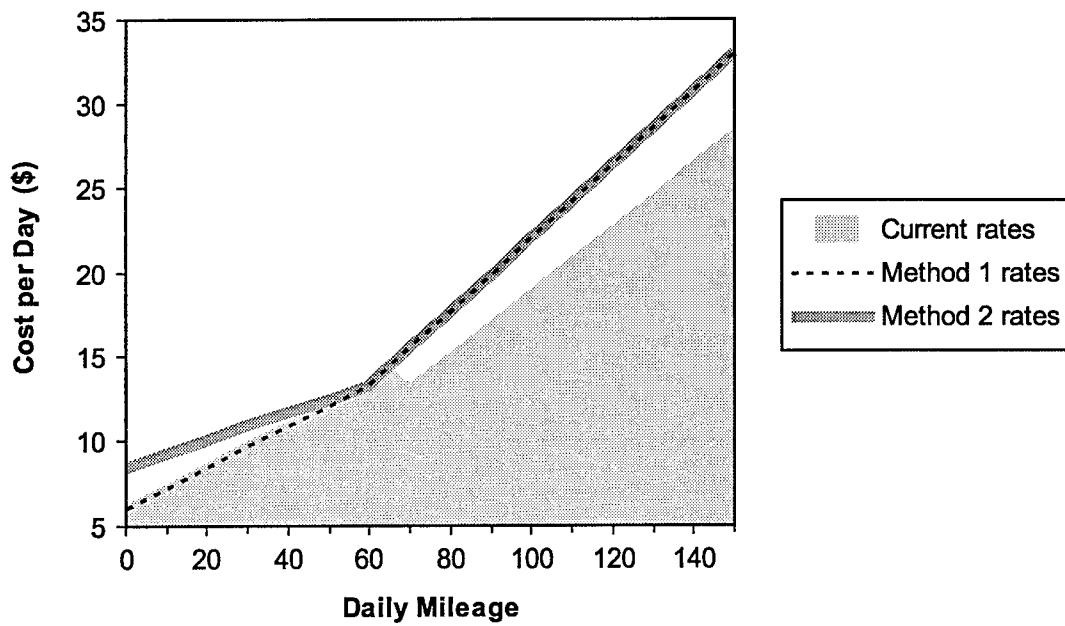


Figure 2. Daily Rental Rate Comparison for Mid-size Sedans

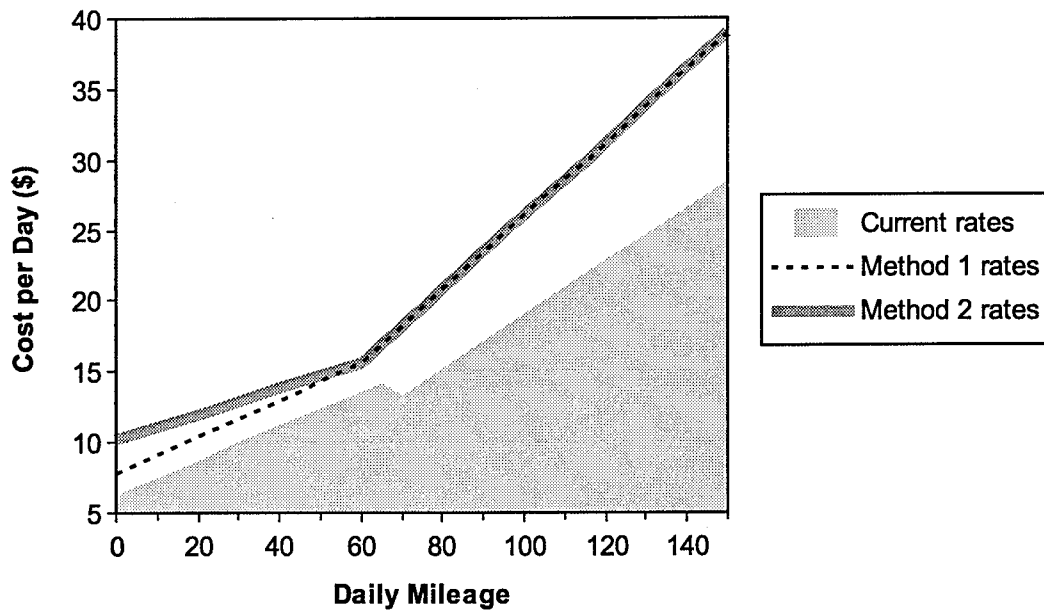


Figure 3. Daily Rental Rate Comparison for Upper Mid-size Sedans, Full-size Sedans, Minivans

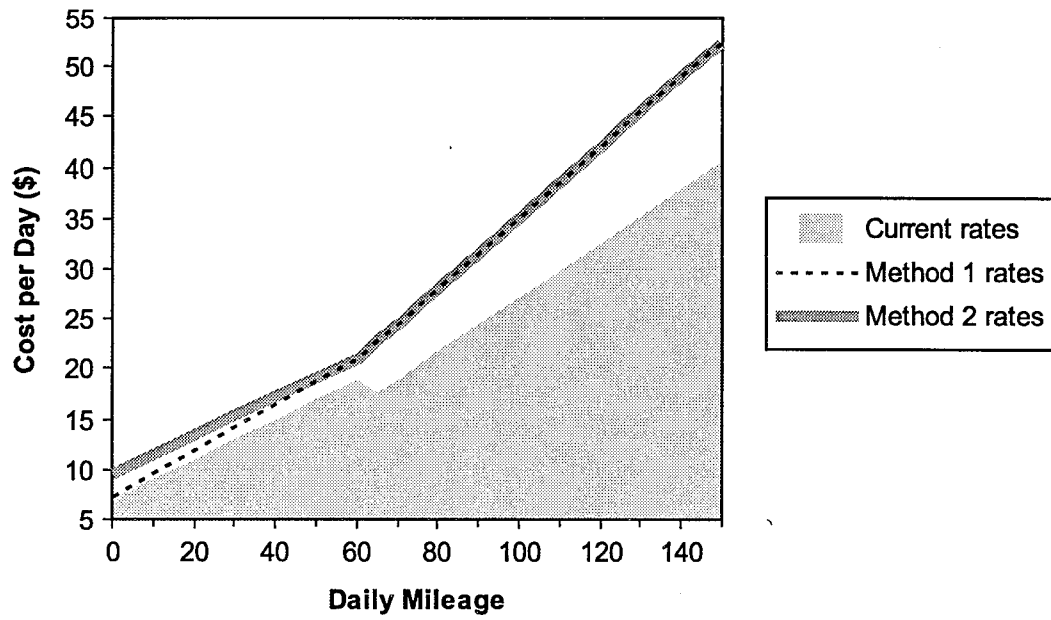


Figure 4. Daily Rental Rate Comparison for Full-size Vans

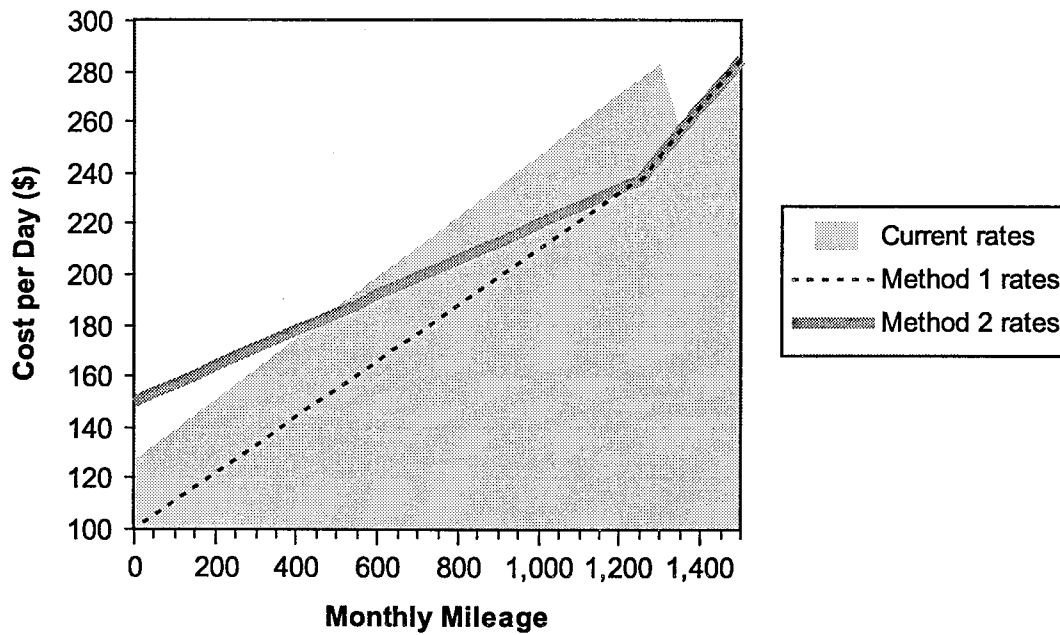


Figure 5. Monthly Rental rate Comparison for Compact Sedans

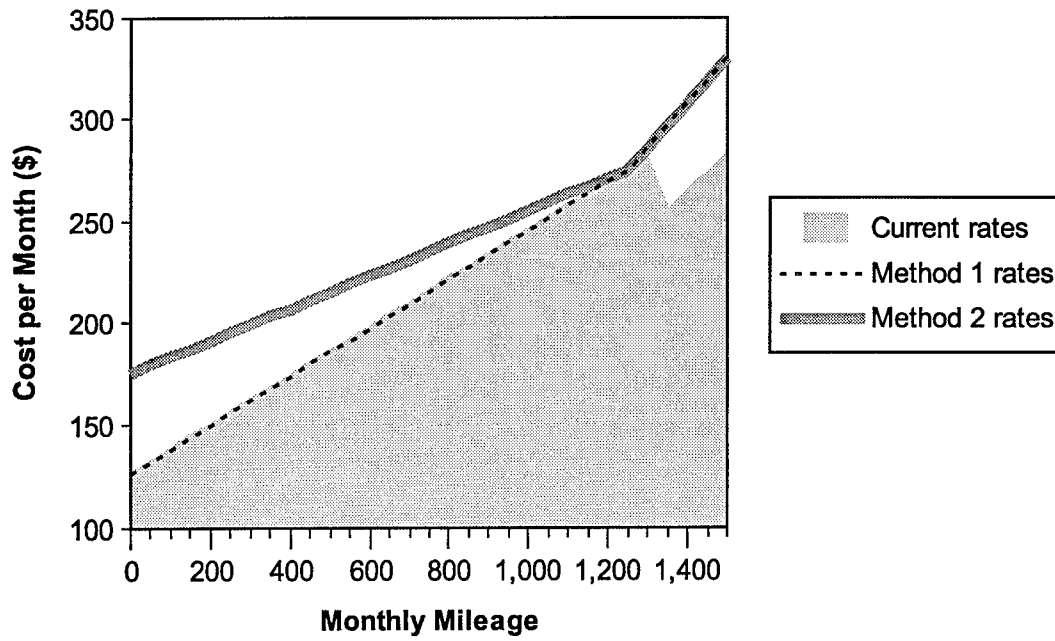


Figure 6. Monthly Rental Rate Comparison for Mid-size Sedans

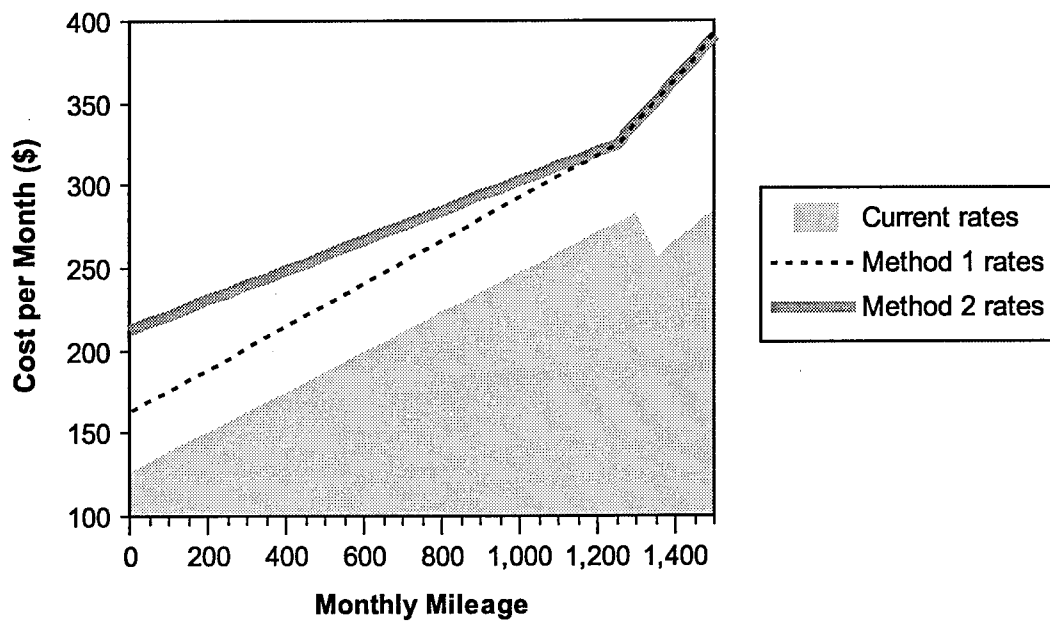


Figure 7. Monthly Rental Rate Comparison for Upper Mid-size Sedans, Full-size Sedans, Minivans

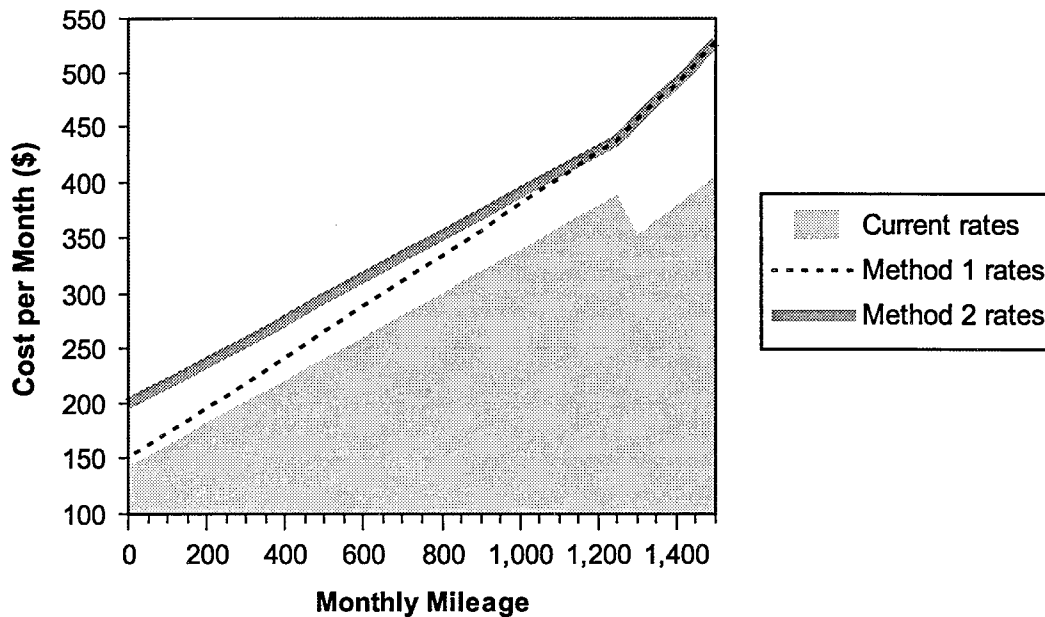


Figure 8. Monthly Rental Rate Comparison for Full-size Vans

## CONCLUSIONS

The researchers used the most recent available data in the analyses, which included 1999 model year vehicle purchase prices. The results of the analyses indicated that Fleet Management could minimize vehicle costs by replacing passenger sedans and minivans at approximately 105,000 miles and replacing full-size vans at approximately 120,000 miles. The analyses of the data indicated that, over time, vehicle purchase prices fluctuate (as demonstrated in Table 1 where the purchase price for a 1999 model year Chevrolet Cavalier was almost \$1,500 less than the cost of a 1998 model year Chevrolet Cavalier), new models become available, and old models are discontinued.

Both of the proposed rental rate structures developed in this study are logical. Method 1 replicates the existing rate structure—the minimum daily or monthly charge captures only the capital costs for the specific vehicle rented. However, the minimum charge in Method 2 recaptures a portion of all the centralized fleet's fixed costs, which are administration, insurance, and fleet expansion. Method 2 captures the capital costs related to the vehicle as well. Since Fleet Management must pay these fixed costs based on the number of vehicles in the fleet, regardless of the mileage these vehicles are actually driven, it is reasonable for Fleet Management to charge a minimum fixed rate that recaptures these costs.



## RECOMMENDATIONS

1. Fleet Management should plan to replace passenger sedans and minivans at approximately 105,000 miles and replace full-size vans at approximately 120,000 miles. Since Fleet Management currently plans to replace vehicles at 95,000 miles (132,000 miles for full-size vans), Fleet Management should appropriately adjust vehicle maintenance decisions to account for the changes in the mileage replacement criterion.
2. Fleet Management should request that JLARC change the centralized fleet vehicle rental rates to the rates presented in Table 4. In addition, Fleet Management should request that JLARC approve the rental rate structures presented in Tables 7 and 8 for trip pool and permanently assigned vehicles, respectively.
3. Fleet Management should reevaluate the rental rates and the capital cost, operating cost, and Fleet Management fixed cost components every 2 years. Additionally, Fleet Management should reevaluate the rental rates following any significant change in vehicle purchase prices or in the composition of the centralized fleet.

## REFERENCES

- Joint Legislative Audit and Review Commission. July 1979. *Management and Use of State-Owned Motor Vehicles*. Richmond, Va.
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